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The Newport Natural History Society,

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OUR BIRDS OF RHODE ISLAND.

BY JAMES M. SOUTHWICK.

I desire to submit to you some rather disconnected remarks upon our birds of Rhode Island and their general habits.

Our little State, from its arrangement of land and water, both salt and fresh, its situation as the southern limit of certain northern fauna and flora, and the northern limit of some forms common to a warmer climate, approached to within twenty miles by the gulf stream, and containing within the waters about Newport many remarkable marine forms, has always offered inducements to the student of Natural History, especially in ornithology.

I have been denied the time to investigate as carefully as I could wish, but so far, I must note a remarkable lack of literature on bird matters, as also upon nearly all Rhode Island zoological subjects.

Elsewhere much time has been devoted to ornithology; as early as 1755 and 1758, Edwards wrote upon the American Ruffed Grouse and the Phalaropes, and in 1759 upon Wild Pigeons.

In 1792, Jeremy Belknap wrote on the birds of New Hampshire.

In 1794, Samuel Williams described those of Vermont and in 1853 Zadoc Thompson in a natural history of Vermont recorded the birds of that State.

Rev. J. H. Linsley compiled a catalogue of the birds of Connecticut, in 1843, and W. O. B. Peabody wrote a treatise on the birds of Massachusetts, in 1839.

We must rest contented that it is more than probable, that whatever has been found in Massachusetts or Connecticut belongs likewise to Rhode Island.

In our sister States it has been and is considered both pleasurable and profitable, to expend time, talent, and money, upon this subject, and many zealously guarded collections, both public and private give tangible evidence to what is or has been.

In the published proceedings of this Society I find a list by Col. John Hare Powel, of one hundred and one birds, shot near Newport and a valuable article on the "Birds of Newport" by

Wm. C. Rives Jr., M. D. In a modest way, contributions on Rhode Island bird matters have been sent to the "*Forest and Stream*" by Mr. Newton Dexter of Providence; and to his liberality the Franklin Society and the collection at Brown University are both indebted for most of their best local specimens. (Notably a Trumpeter Swan, Harlequin Duck, Purple Gallinule, Turkey Buzzard, Passenger Pigeons in full plumage, and others.) Mr. Fred T. Jencks has also done zealous work for ten years and contributed short articles to the *Providence Journal* and to ornithological papers published outside the State.

From the geological deposits in many parts of the United States, have been brought to light the fossil remains of strange bird-like forms. In the jaws of many were true teeth, sometimes fitting into sockets, sometimes into grooves like those of reptiles. Often the vertebræ were continued beyond the body, into a lizard like tail; if there were feathers, they stood out at right angles, on either side, a pair to each bone.

Some of these birds flew about and fished the waters like the Terns or Gulls of the present day; in some the rudimentary wings were useless for flight; they varied in size from that of a robin to about six feet long. From Rhode Island the deposits have been swept away, that should indicate such residents within our borders. But turning to a consideration of recent time.

The latest reported capture anywhere of the Labrador Duck was in 1875, while it was extremely rare for fifteen years previous to that time. I do not doubt that this bird was a visitor to Narragansett Bay. At present some thirty skins, held chiefly by the museums of America, are all that is left to us. Another bird, supposed to have become extinct in 1844, exterminated by the agency of man, is the Great Auk. To-day a good skin is worth $600.00 and only five of them are in the possession of American museums. I do not know that any writers allow this bird a range south of Cape Cod, north of there the many bones found in shell heaps attest to its past abundance. Its smaller relative, the Razorbill Auk, has, during the past winter, been quite common at Newport. I fancy the other was found there at the proper seasons of the year. Doubtless the Pinnated Grouse or Prairie Chicken roamed through our woods, in the years that are past,

along with the Wild Turkey. Mr. J. A. Allen is authority for the statement that this latter bird was common in New England subsequent to the settlements, and probably became extinct in Massachusetts as late as 1833.

About the first of February this present year, I was informed by friends in conversation, and by the daily papers, of the capture of several birds supposed to have visited us, out of season. This led to a little study of the subject and dating from the first day of January, during the season of snow and ice, the ground being frozen ordinarily to the depth of several inches, I find that if we look with diligence in the proper situations, we shall discover many interesting forms, so hardy as to brave the rigors of the climate. I readily obtained data for eighty species of birds taken in Rhode Island about that time, a small minority of them somewhat later.

All through the State, and often in close proximity to our populous towns and cities, we may find the Bob White (American Partridge usually called Quail). These live in small flocks among sheltering brambles or on sunny hill sides, eating berries or seeds from the plants that stand above the snow; in a stress of weather they will come to the barn and poultry yard of the farmer for the hay seed and grain scattered there.

In similar situations we may look for our noble game bird, the Ruffed Grouse (commonly called the Partridge). Any one who has wandered through the outskirts of our woods, will remember the boom and rush with which this bird announces himself as he springs from the ground, and goes off with great velocity, seeming almost to fly straight through the trees and bushes. Their sustenance is much the same as that of the preceding species. Both these birds have many enemies, foxes, weasels, cats, and sportsmen with dog and gun; they also suffer severely when deep snows cover them, and afterward freezing to a crust, imprison and starve the poor creatures.

In the light woods we shall find also one of our handsomest birds, the Blue Jay. Usually he is wild and wary, but at this season, emboldened by hunger, often coming into the orchards and close to farm houses. He is well known among us and adds much to the beauty of the New England woods; the eye detects

his brilliant plumage a long distance away, and his not very musical notes are far reaching.

Again, we find the Flicker. I know of no other bird that enjoys so many local names, such as, High Hole, Wake Up, Harry Wicket, Yellow Jay, Pigeon Woodpecker, Golden Wing, etc. During a little thaw, we may find him hunting grubs on the ground at a distance from any woods, but usually convenient to some large oak tree. He has long ago learned to be on the alert, and while we are a long way off we may catch first, the white flash of the feathers on his rump as he springs from the ground, and then the glitter of the golden color, spread all over the underside of his wings and tail, as he flies swiftly to a perch of observation on the friendly oak, ready to leave that at once if we attempt any further acquaintance.

With a steady, somewhat labored flight, the Crows, from their size and color, are pronounced against a winter landscape. Of course they are plenty in Rhode Island, for while grain, insects and grubs are eagerly eaten, they obtain an abundance of food along our water fronts in the way of mollusks and dead fish.

Our national emblem, the Bald Eagle, makes us now and then a passing visit particularly in winter. During the past season a pair located somewhere about the Seekonk River in East Providence, while a good specimen in the young plumage was received from Charlestown beach in November, 1886. This bird must be at least three years old before he rejoices in the white head and tail; specimens taken in Rhode Island usually have the dark and mottled plumage of the young bird. Mr. Newton Dexter killed an adult in Warwick, about 25 years since.

And now I am able to report the capture at Westerly, about the 17th of February this year, by Mr. J. B. Chapman, of the Golden Eagle, the first recorded instance. It is possible that others have been captured and thrown away, as the plumage in general appearance, is almost identical with that of the young Bald Eagle; the principal and clearly distinguishing mark is that the feathers on the legs of this bird grow down to the opening of the toes, while those of the Bald Eagle stop at the heel.

Owls are always present with us and I enumerate for Rhode Island ten species, known popularly by the names of Cat Owls

and Hoot Owls, this means nothing as I find they are applied indiscriminately to the whole list. Here I would note the only reported capture of the Barn Owl, in November, 1886, by Mr. Joseph Ryder, in Norwood, Warwick, Rhode Island. This bird is most abundant in California, but occurs in Florida and is found all over the country from the Atlantic to the Pacific.

We next meet with the Long Eared Owl. These are vigorous night flyers, feeding upon insects, small quadrupeds and small birds. They remain in Rhode Island the year round, but owing to their habit of keeping quietly located among thick evergreens and in swamps during the day time are not frequently captured.

Short Eared Owls probably remain with us all winter, and are ordinarily found about the marshes and wet meadows. My experience has been that they are never so common as the last species, and less likely to be found during the winter.

Next claiming attention is the Barred Owl, one of our most common species during the winter months. You will please note that it has very dark eyes, in the contrast with all the other forms except the Barn Owl. During the winter of 1883 and 1884 they were wonderfully common and I was cognizant to the capture of more than fifty of them.

Our diminutive species is known as the Saw-Whet or Acadian Owl. They are not generally common, yet I would not call them rare since they are captured each winter, and this year between January 8th, and 21st I know of the taking of several in Johnston, Seekonk and Arctic. At Arctic, a gentleman breeding pigeons discovered that some miscreant had raided his coop, and was so successful in setting a trap that he caught the little thief inside the premises. They probably escape observation, as sitting snugly through the day they can easily masquerade as a lump of dead leaves or a knot on the limb; they choose also thick clumps of bull-briar and juniper.

Our most common kind and regular resident is the Screech Owl. In the country any clean hole in an apple tree may hold its owl. This species is easily distinguished by the prominent ear tufts, and exhibits the curious condition of plumage called dimorphism, for from the same nest come birds that when matured, exhibit a plumage decidedly gray or decidedly red-brown,

and this without regard to sex, age or season. Their habits are nocturnal and their tempers vicious. Two specimens were once left over night in a basket supposably dead, one of them revived and ate half of his dead companion.

In the "*Standard Natural History*" Mr. M. A. Frazer is reported to have said: "January 19th, I took an owl from a nest, and on reaching to the bottom of the hole, I found sixteen Horned Pouts, and four of these were alive. All the ponds were then under two feet of snow and ice and I was at a loss to know where the fish were obtained. I visited the ponds and fully a mile away, some boys had cut holes through the ice to get pickerel bait. The owl had probably stationed itself at these holes, catching the fish as they came to the surface. A busy time of it flying thirty miles for sixteen Horned Pouts."

We now come to a large and handsome species, prominent among them is the Great Horned Owl, distributed with its varieties all over the United States. They are not scarce here, and breed in the State, as proven by three fledglings taken from the old nest of a Fish Hawk, by Mr. Hall of Warren. They are said to be fond of young turkeys and also feed on skunk, this fact is often apparent when you have shot and obtained your owl.

The Snow Owl, Arctic Owl is often called the White Owl. This is a misnomer, for though occasionally a specimen is found that will show only here and there a spot of brown on the white plumage, the great majority are white only on the front and face, the wings, tail, back and head being well sprinkled with spots and bars of brown. During the winter of 1876-7, Rhode Island was blessed with a remarkable flight of these birds; I know of over thirty specimens collected at that time; the following winter I think none were taken. Since that time an occasional specimen has been noted, until this past winter when I have chanced to know of eight or ten Rhode Island specimens. This bird flies by daylight and especially prefers the neighborhood of salt water marshes, where it feeds much upon fish.

The Great Grey or Spectral Owl. This is a woodland owl, living probably upon grouse, hares and such game, and coming south occasionally from the great pine woods of the north. In February, 1883, a single specimen was captured at Fox Island

near Wickford. This is the only record for Rhode Island. Mr. G. M. Gray purchased and mounted this bird and it is being well taken care of. Last and rare we have the Richardson's or Sparrow Owl, an accidental winter visitor.

In pursuit of their legitimate prey, the hawks, Red-shouldered, Red-tailed, Cooper's, Sharp-skinned, Goshawk, and Pigeon Hawk, may be surprised at any time, though of course they are never common. Mr. Waldo Lord, of Providence, has captured one Sparrow Hawk. All the larger kinds are commonly called Hen Hawks or Chicken Hawks, but these names, in this State, apply to nothing in particular. The student trying to identify his captures, will be at first sorely puzzled by the hawks, as the plumage of the first and second years varies so much that they almost appear like different species. It would seem that the hawks are a much maligned race, and their true habits not well understood; generally supposed to be of no value, and predatory on the poultry yard, they are killed without mercy.

A more exact understanding of their habits may serve to place them in a pleasanter light. Mr. Charles Dury in a paper read before the Cincinnati Society of Natural History, gave the result of examinations made by himself, of the stomachs of some eight hawks, two eagles, and thirty-one owls, killed between November 10, 1884, and May 22, 1885, most of them during the winter months. Three hawks contained grasshoppers, two contained mice, and three, small birds. Two eagles contained fish and rats. One great horned owl contained hair; one, chicken; and one, quail. Of other owls thirteen contained mice, thirteen contained insects, one contained a bird and one contained an English Sparrow. The amount of benefit derived from those birds would seem to be much in excess of the injury.

During January 1884, there arrived in Rhode Island large flocks of Pine Grosbeaks; they were plenty all over the State, but when the cold weather left us, they also left and I have known of none since.

About the time that winter reigns supreme, there comes to us large flocks of the Snow Flake or Snow Bunting. Beautiful birds, with white feathers in their wings and tails, and the spotless white of their under parts in marked contrast with the black

and rich brown tints of the back and head. You must look for these visitors on smooth hill sides, and in the meadows and pasture lands where the grasses and weeds protruding above the snow, furnish requisite food. They are more numerous some years than others and they desert us at the first indication of warm weather.

At the same time, and in similar situations you will have little difficulty in starting a flock of Horned Larks or Shore Larks; a pencil tuft of long narrow black feathers extends backward over each ear, in quite the semblance of a horn.

Those of you who have driven or walked through any of the country roads of Rhode Island during the bright, warm days of summer, just as the thistle blooms have ripened and are waiting for the autumnal winds to distribute the downy parachutes, have surely noticed the merry little bird of brightest yellow, with cap and wings and tail of black, as he perches and dandles on a blossom. This is the male American Goldfinch; a little later this pretty plumage is exchanged for one of brown and olive, more like that of the female, and now, in January, you may not recognize him, as he flys away from you in undulatory lines, singing a gentle, short, sweet song.

In the cedar swamps, the Robin or Migratory Thrush is to be found, also the Cedar Bird, large flocks of these since January 15th have been reported from Seekonk, Arctic and Johnston.

Irregularly we find the Ruby crown Kinglet and the Golden crown Kinglet, tiny birds, the smallest next to the hummers, the Black cap Titmouse or Chickadee, the Purple Finch, commonly called Red Linnet, the Winter Wren, the White-breasted Nuthatch, the Hairy Woodpecker, the Downy Woodpecker, the Yellow-bellied Woodpecker, the American Crossbill, the White-winged Crossbill, the Junco or Snow Bird, the Cow Bird or Cow Black Bird, a pair killed this year during the cold weather of January 19th; surely these early birds were not looking for worms. The Red-wing Black Bird, the Meadow Lark or Marsh Quail, the Wilson's Snipe; one was killed by Mr. Charles Carpenter on Thanksgiving day, 1882, and two others at Fields Point in the month of January. Mr. Newton Dexter informs me of taking Woodcock, one Virginia Rail, and three Carolina Doves all

during cold winter weather but the exact date is not now available. Some years since, on the first day of January Mr. Frank Dexter followed a Kingfisher along the Ten Mile river, and in 1884, on January 5th and 10th, two Night Herons were taken in Bristol, the weather being cold at that time.

The Butcher Bird or Northern Shrike, is an irregular attendant with us, and on February 16th, of this year, I observed three Blue Birds, commonly spoken of as harbingers of spring.

The English Sparrow, well, they are best described by an old English friend of mine, who calls them "A perennial nuisance."

Turning now to the marine waters of Rhode Island, from Riverside to and about Newport, we may find many gulls, singly and in flocks, chiefly the Herring Gull, occasionally a Great Black-backed, and oftener, though somewhat irregularly, the Bonaparte's and Kittewakes; also many sorts of ducks such as the Buffle-head or Dipper, Dusky or Black Duck, Golden Eye or Whistler, Long-tail Duck or Old Squaw, Velvet Duck or White-winged Coot, Scoter or Yellow-bill Coot, Surf Duck or Patch-bill Coot, Scaup Duck or Broad-bill or Blue-bill, the Goosander, and the Red-breasted and the Hooded Merganser, the common Eider Duck, the Horned Grebe and the Dabchick and one specimen of the King Eider taken at Nayatt, the only capture I have known, is now in my possession. The Wild Mallard is not uncommon and the Red-head, the Canvas-back and Harlequin have been taken. Earlier and later in the season, I could add to this list, the Pin-tail Sprig-tail or Gray Duck, and the Blue-winged and Green-winged Teal, and the Canada, Snow and Brant Geese. Hunters complain that birds are not as plenty as in days gone by. This seems to me the inevitable result of many causes. I do not see that much can be practically done for either the birds or the gunners. Each year brings to our waters an increase of steamers large and small, and sailing craft of every sort, and each year adds along our American coast new light-houses, while the latest appliances have greatly increased the power and brilliancy of the lights. These, while necessary to man, are terrible snares for birds, particularly the small ones; during their migrations hundreds annually dash themselves to destruction against these large lanterns. Incident-

ally, telegraph and telephone wires are responsible, but chiefly men and boys. The market gunner, the millinery collector, the scientists, the taxidermist, and the gentleman sportsmen all have their several interests. We in Rhode Island, have plenty of law on the subject, but no enforcement, and indeed it must be very difficult to frame a law that can be enforced, or that will do justice to all or most of the interested parties. It has been suggested that in different sections of the country or States, certain lands or parks be set off and carefully officered, as safety retreats for the exclusive use of the birds. Many or most of them quickly adapt their habits to any protective situation even in the midst of civilization. (The naturalist, Waterton, said, and proved it as well, that if he provided a suitable place the birds were sure to find it.) I would instance the Herring Gulls and several sorts of duck that, during the colder months, frequently settle in the Cove Basin, near the railroad station in Providence, and the Purple Grackles that are plenty in the heart of that city, where the trees are suitable for their use.

Many of the winter birds that I have mentioned have their summering and nesting places in Maine, Labrador and situations still further north. A few of them remain with us the year through, or rather the species do, represented by individuals that have wintered in the south, perhaps in Florida or the Bahamas.

It would be tedious for me to designate all the birds that multiply within our borders, but I estimate about one hundred species; and adding to the numbers already mentioned, those that migrate through the State, remaining but a few days, I can, from the data that I have on hand, report the capture of at least two hundred and thirty species. According to the latest authorities only seven hundred and sixty eight species are allowed to North America so we do not make such a bad showing. If the members and friends of this Society would follow the most excellent advice of its curator and devote some energy to a systematic collecting of local or State specimens, or even note with care and put on record with this Society their observations, many a worthy addition would soon be made to our present knowledge. I think that if some one with time at command, and even a limited amount of money would carefully study the Cumberland portion, and particularly the southern part of the State about Washington County, much that is new might be learned.

I have received from Newport, May 18 and June 2, both Least Sandpipers and Semipalmated Sandpipers; it is probable that they do not breed in the State, but if they do not it seems peculiar that they should be here during the breeding season; herein lies a mystery for someone to solve.

With us the most favorable time to observe such birds as migrate through or remain in Rhode Island, seems to be from the first to the twentieth of May. To obtain full benefit, a start must be made very early in the morning (birds do not slumber on their perches after the first streak of dawn); at such a time the warm air is sweet with the fragrance of opening buds; robins, orioles, larks, and tanagers whistle from the tree tops. The red-winged blackbird *concarees* in the swamps while troops of little finches and warblers keep up a chorus in every thicket. While I believe the number of our resident birds is not so great as in time past, I still think that some residents of our cities would be surprised at what they might see and enjoy if they could renew their youth, and at sunrise in favorable situations look and listen, they would find the conditions much the same as when they were boys, but "the mountain will not go to Mohammed. Mohammed must go to the mountain".

Commonly to be found with us are two kinds of Bitterns, and three kinds of Herons, with one instance of a fourth. Our largest species (the Great Blue) is most popularly called a Crane. This is a serious error; the Crane is taller, has no powder-down tracks, and the whole plumage is more compact and smooth. I find no record of the Crane in Rhode Island.

Our Herons, like others of their group, have on different parts of the body three pairs of spots of compact, dark, yellowish down, a peculiar appendage perhaps not altogether understood, but supposed to emit a phosphorescent light, useful to its owner when on a night fishing trip, and also thought by some observers to be useful in ridding the birds of insect pests, for the herons are singularly free from such. Their food is chiefly fish and frogs; they eat voraciously, but rarely grow fat. I judge they are seldom killed for food, although I can testify that a nicely cooked Heron is very palatable.

It is needless to mention in detail our common game birds and

our common every day residents, but I am frequently confronted with the idea, that there are several sorts of Humming Birds to be found here. We have only one species, i. e., the Ruby Throat, the male alone has the brilliant throat, but the female is even more frequently seen with her simple green back and head, white throat and under parts.

We have also the Night Hawk, and the Whip-poor-will; the points of difference are clearly noted in all books on this subject, still it seems that they are not well understood and I will venture to state them.

The Night Hawk has white spots on the wing, Whip-poor-will none; The Night Hawk has tail slightly forked, Whip-poor-will rounded; The Night Hawk has no hairy like feathers at its mouth, Whip-poor-will has them; The Night Hawk flies high, Whip-poor-will skims low.

We have with us the Purple Martin, the Chimney Swift, and four species of swallows, five species of sparrows, and eight species of warblers; our resident Tanager with his brilliant scarlet body, his black wings and tail, is simply tropical in his coloring.

We have two kinds of Cuckoos, and both of them build their own nest and rear their own young, while the fact that they eagerly devour hairy larvae, refused by most birds, make them our worthy friends.

Our birds, like individuals, have their eccentricities; they show them in part in their nesting habits. A friend who has climbed to the nest of many a Fish Hawk, finds in most of them an old shoe. The Great Crested Fly Catcher weaves always into her nest, the cast off skin of a snake. Our Vireos make pretty cup shaped nests, suspended between the forked twigs of some bush, or low tree; they are among the most beneficial of our birds, actively and continually searching for insects and larvae. The Yellow Warbler weaves a model cup, compact, with fine grass, cotton and woolly material lined with caterpillar silk, hairs and down of plants. Into this dainty receptacle the Cow Bird often drops her egg; this intrusion is resented by the Warbler, who will often add a second story to the nest completely covering the obnoxious egg and I have seen a nest that had three stories. The dainty Warbler had been twice imposed upon by the Cow Bird, but finally came off triumphant.

I am aware that many persons who have given only occasional thought to zoological study, consider the subject a pleasant one, but not particularly useful or practical. Permit me to enumerate some of the necessities for such study and such collections. Children gaze for hours, delighted with the subject, though not understanding it, and their quick perceptions note matters of form, color and habit never to be forgotten.

Our laboring population turn to such collections for healthy rest and recreation, and most foreigners have knowledge on the subject, far in advance of the average American.

The designer for the weaving or printing of fabrics, the potter, the wood carver, and the jeweler, copy the colors and forms of insects, shells, and plants, into the most satisfactory and saleable products of their arts, yet their frequent complaint is that they cannot obtain study from actual specimens and must copy from representations that, although faulty have, alas, become well known through frequent reprint.

What can be more practical in agriculture than a correct understanding of the form and habits of noxious insects and their parasites, and the ability to distinguish between those that are useful and those objectionable. Certainly the systematic study of food fishes and mollusks is worth thousands of dollars to this country.

THE WATER-BIRDS OF NEWPORT, R. I.

BY CHARLES H. LAWTON.

These observations were made by Mr. Lawton during his various excursions as a sportsman around our ponds and shores:

The Black or Dusky Duck is the commonest in this vicinity, and is to be found on Aquidneck Island, on which Newport stands, all the year round. It breeds occasionally in a marsh near the Hanging Rocks opposite the Second Beach. Among fresh water-birds he instanced the Wood Duck, so remarkable on account of its beautiful plumage, a species which breeds in the woods in the western part of this State. In former years the American Widgeon used to be plentiful about Newport, but is not so now. The Pintail Duck is still occasionally met with around our bay, and is very abundant on Block Island. The Blue-winged Teal are always to be met with after the first north-west wind in September; the Green-winged species comes later. River ducks are distinguished from sea ducks by having no lobe or flap on the hind toe. The commonest sea ducks here are the Old Squaws or Long-tailed Ducks. The Velvet Scoter and Surf Ducks are often found together, feeding on mussels and other mollusks. They are called "Coots" by our local gunners. The Eider Duck, locally called the Wamp, is also plentiful here some seasons. The allied species, the King Eider, is also now and then met with. The Mergansers close the list of our real sea fowl. There are three species, the Red-breasted or Sheldrake, the Goosander and the Hooded Merganser.

With respect to those birds, which though properly sea ducks, are often found frequenting fresh water, may be mentioned the Whistler or Golden-eye, often seen in large flocks on East river and off Mount Hope Bay. These with the Blue Bills, Greater and Lesser Scaups, and the ring necked species, form a little family by themselves, and are quite abundant in this vicinity during the fall and winter migration. The Red-headed Duck is very plentiful in the salt pond on Block Island, going out of the pond every night toward the west and returning at daybreak,

The most abundant of the migratory ducks is the Ruddy or Broad-bill, of which large numbers are shot at Easton's Pond every season. They are a stupid sort of Duck and easily approached when they first arrive. The Buffle-headed Ducks (locally called "Butter-balls") come in and remain until the ice forms. The Mallard or Green-head, the Shoveller or Spoonbill, and the Gadwall have all been taken here, as well as the Canvas-back Duck.

In the goose family, the commonest is the Wild or Canada Goose. A few were shot this winter at the life saving station. The Snow Goose is a rare visitant. The Brant Goose is a regular spring migrant. The Gannet or Solan Goose is often met with a few miles off shore. The common Cormorant is very plenty, and flocks of them are often seen flying over the city in the late spring; they are often mistaken for wild geese. We have two divers here, the Great Northern or Loon, and the Red-throated. In the grebe family, there are three varieties in this vicinity, namely, the American Red-necked Grebe, which is very rare; the Horned Grebe (locally called the Tinker), and the Pied Grebe or Dabchick. The last is the commonest, arriving here about the 1st of September. Last winter a number of Razor-billed Auks visited our shore—an unusual species here. This winter several foolish Guillemots or Murres have been shot.

As regards Gulls, Terns and Petrels, they would require a paper for themselves. Herring Gulls, the Great Black-backed, the Bonaparte Gull and the Kittiwakes are of frequent occurrence. The common Tern or Mackerel Gull breeds with us, while Mother Carey's Chickens and Shearwaters are to be found a few miles off the coast.

ON CERTAIN PHENOMENA PRODUCED BY THE DETONATION OF GUN COTTON.

PROF. CHARLES E. MUNROE, S. B., F. C. S.,
Chemist to the Torpedo Corps, U. S. Navy.

Gun-cotton is, as its name implies, an explosive substance, produced from cotton. It is necessary only to immerse pure dry cotton for twenty-four hours in a mixture of the strongest nitric and sulphuric acids to convert the cotton into gun-cotton. The subsequent treatment which the gun cotton undergoes is solely for the purpose of purifying it.

This substance was discovered by Schönbein in 1846, but its present usefulness as an explosive is dependent upon three subsequent discoveries. 1st, Abel's: That gun-cotton may be completely freed from acid by converting the gun-cotton into pulp. 2nd, Nobel's: That a high explosive may be detonated by the initial detonation of mercury fulminate. 3rd, Brown's: That not only may dry gun-cotton be so detonated but that it may also be detonated when wet if only a small initial mass of dry gun-cotton is detonated in contact with it.

Dry gun-cotton may be exploded, if confined, by contact with a spark, flame or heated body or by a blow between metals like iron, but if unconfined and loose it will be very rapidly consumed. The speed of combustion may be very materially diminished by compressing the cotton, and the pulping of the material enables us to do this very readily, so that it is now always produced in this form for use as an explosive. The gun-cotton for the U. S. Navy, which is manufactured at the Torpedo Station, is issued in the form of cylindrical disks three and a half inches in diameter and two inches in height or in rectangular blocks of nearly the same dimensions.

When wet with twenty per cent. of water, gun cotton is practically incombustible and when exposed to fire in this state the surfaces are gradually consumed layer by layer as the water dries out from them, hence it is very safe to store and transport when in this state, and as it may be exploded by detonation while wet, it is issued to the service in this condition. Gun-cotton, therefore,

while ranking among the most violent of explosives, possesses a degree of safety which obtains with no other.

The advantage which accrues from the use of the mercury fulminate detonator is two-fold, for it not only enables us to explode gun-cotton while the latter is yet too wet to burn, but it also causes the gun-cotton to develop a greater force than it manifests when exploded by simple ignition, and, further, it causes the violent explosion of the gun-cotton when the latter is unconfined.

It is now a well known fact that when compressed gun-cotton, dynamite or other high explosives are freely exposed upon a metal plate and detonated, if the plate is sufficiently strong to resist rupture, the explosive leaves a marked and permanent impression upon the plate, the intensity of the impression being, of course, dependent upon the intensity and amount of the explosive used. This is not surprising when we recall that Berthelot found that gun-cotton having a density of 1.1 developed, when in contact, a local pressure of 24,000 atmospheres or 160 tons on the square inch, and if we remember too that this enormous pressure is realized in an exceedingly brief space of time. The effect may, of course, be enhanced if the explosive be tamped with earth, water and the like, but as Cooke* has so clearly shown, in his essay on the "Atmosphere as an anvil," the aerial fluid may serve as a tamp just as the aqueous one does, though not as efficiently

It is perhaps not so well known a fact that the impression produced by the exploding mass is an almost exact copy of the form of that surface of the explosive which was in contact with the plate of metal. This feature is best observed with compressed gun-cotton, since, as it is a *papier-maché* like body, it is possible to shape it as we fancy, and to stamp upon its surface such figures and designs as we wish.

The first recorded observation of this phenomena of which I am aware, is that made by Lieutenant Max von Förster of Walsrode.† He says, that when a piece of compressed gun-cotton is detonated on a plate of iron, an accurate impression of the form of the under surface of the gun-cotton is produced, every angle, every projection and every indentation present in the gun-cotton

*Popular Science Monthly, 5, 220; 1874.

†Van Nostrand's Eng. Mag., 31, 113; Aug., 1884.

being impressed on the underlying iron, and he claims that this is due to the fact that the gases acting on the iron have occupied exactly the same space, and no more than the solid explosive previously occupied and thus transferred its form, and hence he concludes that only the gases evolved by the very undermost layers of gun-cotton act on the iron while the others are lost.

In this same magazine* I have given an illustration of similar impressions which I had observed previously to meeting with von Förster's paper, and I advanced the opinion then and subsequently in my Notes on the Literature of Explosives,† that it was due to projection; the residual gun-cotton being driven into the metal by the explosion of a portion of the original mass just as any other body, interposed in the path of the explosive wave, would have been. Of course, we are met here by the difficulties that this hypothesis implies: (1) That the pressure exerted upon the residual mass of gun-cotton is transmitted more rapidly than the explosive reaction is propagated within the mass, and (2) it implies also a great rigidity or coherency for this mass. The last condition requires that which is a property of masses of matter when moving at high velocities as in the well known candle experiment, and in the cutting of steel by soft iron and the like. The difficulties presented in the first condition do not seem so great as those in Lieutenant von Förster's hypothesis.

Some months subsequent to this, Commander T. F. Jewell, U. S. Navy, read a paper before the American Association for the Advancement of Science‡ on the "Apparent resistance of a body of air to a change of form under sudden compression," and presented as an example of the action of this phenomenon, an iron plate upon which a disk of gun-cotton had been detonated. The letters U. S. N. and the figures 1884 had been indented in the surface of the gun-cotton, and similar letters and figures were found indented in the iron plate. He held that this indentation was due to the fact that the air enclosed in the letters and figures in the disk acted, under the sudden and enormous pressure to which it was subjected, like a hard body and was thus driven into the iron.

*Van Nostrand's Eng. Mag. 32, 1; Jan., 1885.
†Proc. Nav. Inst., 11, 110; Feb., 1885.
‡ Proc. Am. Assn., 34, 81; 1886.

In a later pamphlet (Berlin, 1886,) von Förster again states that the gases generated by the detonation of the gun-cotton have, in the first instant, and as long as they exert their maximum force, the exact form and occupy the same space as was occupied by the gun-cotton before detonation and thus they produce an exact impression on the plate of the surface of the gun-cotton in contact with it, and he also says that the suddenness with which the power is exerted is shown by placing a leaf between the gun-cotton disk and the iron, for after detonation the whole frame or skeleton of the leaf will be found raised upon the iron. He explains that this is due to the larger as well as the smaller ribs of the leaf protecting the underlying parts of the iron while the thinner parts between could not yield such protection, and under them the impression is deeper.

This was the condition of the subject when I again began to study it experimentally in 1886. I then first detonated gun-cotton disks in which the figures and letters were indented and obtained impressions on the plates, in which these were also indented. I next used disks having raised letters and figures and obtained impressions in which these were also raised. Next I cut deep channels in the disks, of various forms, taking care that they always communicated with the outer air so that there would be no air confined in them, and again the impressions were exactly reproduced in the iron. I next filled the indented letters and figures, in disks such as Jewell used, with paraffine and with vaseline, so that the material was flush with the surface of the disk, and, on detonation, the letters and figures were found to have been obliterated. I next struck, with stamps, similar letters and figures on an iron plate. This plate was laid face downwards on another iron plate and a lettered gun-cotton disk was placed on the upper plate and detonated. The result was, that while the gun-cotton disks produced the usual indented letters on the back of the top plate of iron, the top plate in whose letters and figures air was also confined and which was subjected to the same blow, produced raised letters and figures on the iron plate on which it rested. These last three experiments certainly seem to prove that the resistance of air to compression has nothing to do with this action. Again, when we consider how enormous the

pressure to which this air is subjected becomes, we must believe that, no matter how suddenly the form is applied, the air must undergo some compression, yet we find that the indentations in the iron are often nearly as deep as those in the gun-cotton.

In considering von Förster's hypothesis, we are willing to admit that the gases at the time of detonation possess the exact form and occupy the same space as the gun-cotton from which they are formed provided the change takes place instantaneously. But it does not; in fact it occupies so appreciable a period of time, that the rate of propagation of the detonation in it has been measured. Apart from this and even granting it, it will be observed that von Förster does not explain how the impression is to be produced by the gas. If the gas moves as a coherent mass, then the impressions should be the reverse of what we get.

From my recent experiments, I am the more strongly convinced that the effect is a purely ballistic one and that while the base of the gun-cotton, or its products, are projected as a whole against the plate, where the intervening spaces are the greatest, there we have the greatest indentation. This is true, also, in the leaf experiment which has been exquisitely reproduced. The varying thicknesses of the leaf vary the distances through which the material is projected and hence the form and texture is reproduced in the impression.

I take pleasure in exhibiting the specimens described and also two others which I have produced to-day. The first was made by placing a gun-cotton disk in a tin can, 5 inches in diameter, and just covering the disk with water. The smooth bottom of the can rested on an iron beam. After detonation, the beam was found ruptured and its face indented as shown in *Fig. 1* where F represents the iron beam, B the original position of the gun-cotton, A B′ the base of the can, B′B′ the indentation corresponding to the base of the gun-cotton, B C a smooth space beyond, C D a space covered with ripple marks visible under a microscope and D A a space covered with ripple marks easily seen by the naked eye. *Fig. 2* is a photostereotype of the face of this iron beam.

The second specimen was produced by placing a gun-cotton disk in a tin can just large enough to admit it, and covering the

FIG 2.

FIG. 3.

disk with water. The bottom of the can had a grooved channel let into it and a spot of solder projecting above the center. After detonation, the beam was found ruptured and on its face there was an exact reproduction of the bottom of the can as seen in *Fig. 3*, which is a photostereotype. Evidently, here the material of the can has been projected into the iron beam.

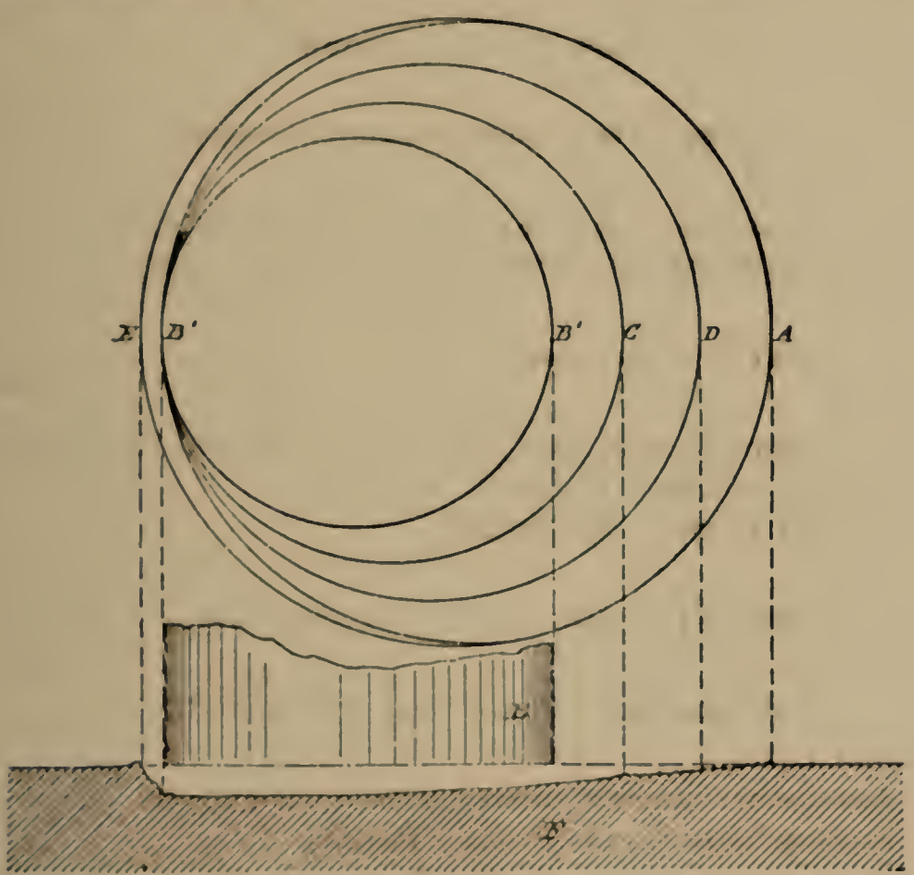

FIG. 1.

NATIVE PLANTS OF THE ISLAND OF RHODE ISLAND.*

IV.

CARYOPHYLLACEÆ.

Saponaria officinalis, Common Soapwort.

LINACEÆ.

Linum usitatissimum, Common Flax (Portsmouth).

LEGUMINOSÆ.

Medicago sativa, Lucerne (Coaster's Harbor Island).
Cassia Chamæcrista, Partridge Pea (Quaker Hill).

ROSACEÆ.

Spiræa salicifolia, Common Meadow Sweet.

COMPOSITÆ.

Bidens chrysanthemoides, Large Bur-Marigold (Portsmouth).
Cichorium intybus, Chicory.
Centaurea cyanus, Bluebottle.

LOBELIACEÆ.

Lobelia inflata, Indian Tobacco (Portsmouth).

LABIATÆ.

Hedeoma pulegioides, Pennyroyal (Portsmouth).

POLYGONACEÆ.

Polygonum hydropiperoides, Mild Water-Pepper.
Polygonum orientale, Prince's Feather.
Polygonum persicaria, Lady's Thumb.
Polygonum articulatum, Jointweed (Portsmouth).
Polygonum aviculare, Knotgrass.

EUPHORBIACEÆ.

Euphorbia maculata, Spotted Spurge.
Euphorbia hypericifolia, Larger Spotted Spurge.

ORCHIDACEÆ.

Spiranthes graminea, Ladies' Tresses.
Spiranthes cernua, Ladies' Tresses.

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*For these additions to the Flora of the Island, the Society is indebted to Mrs. J. M. Smith.

LIST OF COMMUNICATIONS LAID BEFORE THE SOCIETY, 1887-1888.

THOSE MARKED * ARE NOW PUBLISHED.

		PAGE.
1887.		
June 23.	Mr. J. M. K. Southwick, "Notes on Food Fishes."	
"	Mr. A. O'D. Taylor on the "Mygale Hentzii" and the "Pompilus formosus."	
July 21.	*Mr. James M. Southwick on "Our Rhode Island Birds,"	3
Aug. 25.	Mr. L. D. Davis on "The Trees of Newport."	
Oct. 20.	*Prof. Charles E. Munroe, on "Certain Phenomena attendant on the Explosion of Gun Cotton," . .	18
Dec. 16.	Mr. A. O'D. Taylor on "The Hibernation of Animals."	
"	*Mr. Charles H. Lawton, "Observations on the Water-birds of Newport, R. I."	16
1888.		
Jan'y 7 to 3d March.	A series of nine Saturday evening educational lectures on "Zoology," by Mr. T. Nelson Dale.	
April 19.	Mr. T. N. Dale on the "Orchids of Greylock Mountain. Berkshire County, Mass."	
"	Mr. John Swan, Jr. on a "Series of the Local Flora of Rhode Island."	
"	Mr. Henry L. Smythe on the "Occurrence and Causes of Subterranean Mountain Streams on Monadnock Mountain, New Hampshire."	
"	Mr. A. O'D. Taylor on the "Ancestry of the Dog and on its varieties mentioned in Shakespere."	
"	Mr. Amon Parmenter on the "Occurrence of the Golden Carp on Aquidneck Island."	
	*Native Plants of the Island of Rhode Island, List of Flora, Part IV.	24

RECTIFICATION OF AN OMISSION.

The Council regret that, through an oversight, the following resolutions, adopted 15th April, 1886, did not appear in the volume of Proceedings for 1886–1887.

RESOLUTIONS.

At a meeting of the Newport Natural History Society, April 15th, 1886, the following resolutions were passed:

WHEREAS, It has pleased God to remove from this world Dr. Samuel W. Francis, one of our Vice-Presidents, it is

Resolved, That the Society is deeply sensible of what it owes to Dr. Francis as the founder, and as one who spared neither time nor trouble to advance its interests, and promote the study of Natural History.

Resolved, That in common with his many friends the Society laments in Dr. Francis, a man of varied culture and scientific attainments, and an honorable and useful member of the community, whose Christian virtues and peculiarly warm-hearted and affectionate nature, render his loss a great one, and will cause the sorrow of the Society for his death, to be always associated with feelings of regard and esteem for his memory.

Resolved, That the Society tenders its sincere sympathy to the family of the deceased.

Resolved, That copies of the above resolutions be sent to the Newport newspapers, and that they be recorded on the minutes of the Society.

WILLIAM C. RIVES, JR.,
GEORGE GORDON KING,
Committee.

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